Math 361 **Numerical Analysis** Taylor Larrechea
9/12/19 Quiz 4 Name

Answer the following questions in the space provided. **Show all work.** (35 pts. total.)

1. Consider $f(x) = x^3 - 3.9x^2 + 2.4x - 1$.

(a) Write $f(x)$ in nested form. (5 pts)

$((x-3.9)x+2.4)x-1$

(b) Using three-digit rounding and nested calculations, evaluate $f(x)$ at $x = 1.77$. Be sure to show all work. (10 pts)

$x - 3.9 = 1.77 - 3.9 = -2.13$

$(x-3.9)x = -2.13(1.77) = -3.7701 \approx -3.77$

$(x-3.9)x+2.4) = -3.77 + 2.40 = -1.37$

$((x-3.9)x+2.4)x = -1.37 \cdot 1.77 = -2.4249 \approx -2.42$

$((x-3.9)x+2.4)x-1 = -2.42 - 1.00 = -3.42$

$f(1.77) = -3.42$

2. The roots of the quadratic equation $x^2 + 76x + 1.02 = 0$ can be found using appropriate selections from the following formulas. For each root, circle the formula that provides the best computational approximation, and then provide a brief justification for your selections. Do NOT perform the actual computation of the solutions. (10 pts)

(a) $x_1 = \dfrac{-b+\sqrt{b^2-4ac}}{2a}$,

(b) $x_1 = \dfrac{-2c}{b+\sqrt{b^2-4ac}}$

(c) $x_2 = \dfrac{-b-\sqrt{b^2-4ac}}{2a}$

(d) $x_2 = \dfrac{-2c}{b-\sqrt{b^2-4ac}}$

we want to avoid cancellation errors and (b) and (c) both limit the cancellation errors that may occur

3. From calculus, the right sum is used to approximate the integral of a function f over $[a, b]$, and has the form

$$s = \frac{y_1 + y_2 + \cdots + y_n}{n}(b-a),$$

where $y_1, y_2, \ldots, y_n = f(x_1), f(x_2), \cdots, f(x_n)$ are the function values on n equally spaced nodes x_i in $[a, b]$. Write an algorithm in pseudocode that computes the right sum s, where the values $y_1, y_2, \ldots, y_n$ are given. (10 pts.)

Input : a, b, n, $y_1 \cdots y_n$
Output : S
Step 1 : Set S = 0
Step 2 : for i=1 up to i=n, do
S = S + y_i
Step 3 : S = S/n · (b-a)
Step 4 : output (S)
STOP